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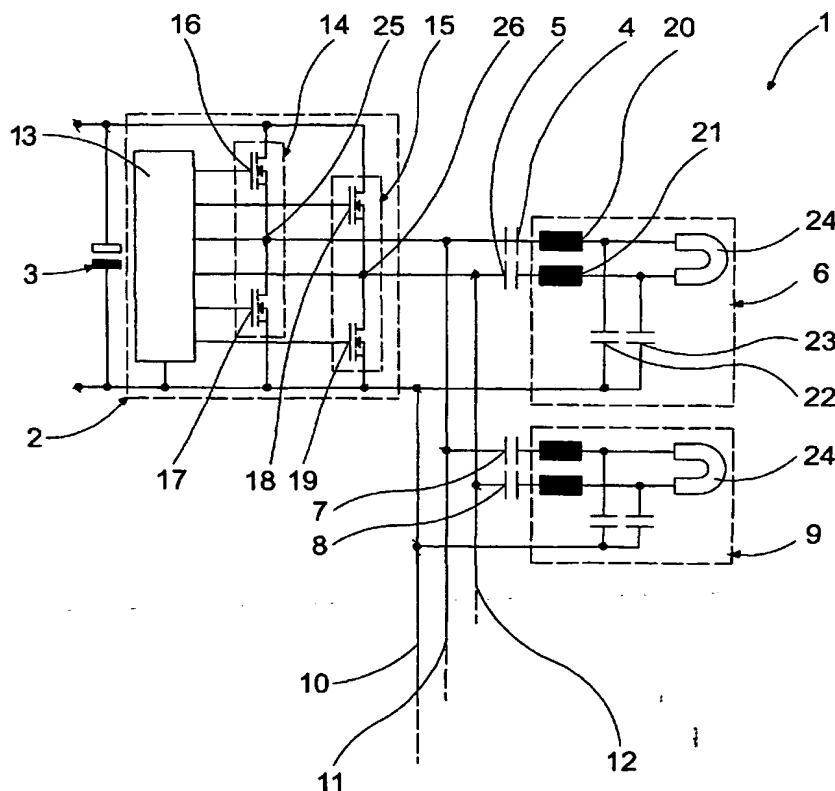
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18 December 2002 (18.12.2002) (72) Inventors; and
(75) Inventors/Applicants (for US only): **BÖKE, Ulrich** [DE/DE]; c/o Philips Intellectual Property & Standards GmbH, Weissshausstr. 2, 52066 Aachen (DE). **BOCK, Antoon** [DE/DE]; c/o Philips Intellectual Property & Standards GmbH, Weissshausstr. 2, 52066 Aachen (DE).
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- (71) Applicant (for DE only): **PHILIPS INTELLECTUAL PROPERTY & STANDARDS GMBH** [DE/DE]; Stein-
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[Continued on next page]

(54) Title: CIRCUIT ARRANGEMENT FOR OPERATION OF ONE OR MORE LAMPS



(57) Abstract: The invention relates to a background lighting system for a liquid crystal display, more particularly to an electronic circuit for operation of one or more discharge lamps. A DC/AC full-bridge inverter circuit generates two voltages whose AC components are phase-shifted by 180°. The discharge lamps are supplied with the sum of these two AC voltages.



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A. CLASSIFICATION OF SUBJECT MATTER
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B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, COMPENDEX, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 615 093 A (NALBANT MEHMET K) 25 March 1997 (1997-03-25) column 1, line 12 -column 11, line 24; figures 1-9	1-5
X	----- GULES R ET AL: "A 1.2 kW electronic ballast for multiple lamps, with dimming capability and high-power-factor" APPLIED POWER ELECTRONICS CONFERENCE AND EXPOSITION, 1999. APEC '99. FOURTEENTH ANNUAL DALLAS, TX, USA 14-18 MARCH 1999, PISCATAWAY, NJ, USA, IEEE, US, 14 March 1999 (1999-03-14), pages 720-726, XP010323608 ISBN: 0-7803-5160-6 page 720 -page 723; figures 1-10 ----- -/-	1-5

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

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Name and mailing address of the ISA
European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Albertsson, E

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>TADESSE D ET AL: "A comparison of power circuit topologies and control techniques for a high frequency ballast" INDUSTRY APPLICATIONS SOCIETY ANNUAL MEETING, 1993., CONFERENCE RECORD OF THE 1993 IEEE TORONTO, ONT., CANADA 2-8 OCT. 1993, NEW YORK, NY, USA, IEEE, US, 2 October 1993 (1993-10-02), pages 2341-2347, XP010118644 ISBN: 0-7803-1462-X page 2341 -page 2345; figures 1-6</p>	1-5
X	<p>SPIAZZI G ET AL: "High-quality rectifiers with high-frequency insulation-an overview" INDUSTRIAL ELECTRONICS, 1995. ISIE '95., PROCEEDINGS OF THE IEEE INTERNATIONAL SYMPOSIUM ON ATHENS, GREECE 10-14 JULY 1995, NEW YORK, NY, USA, IEEE, US, 10 July 1995 (1995-07-10), pages 64-71, XP010161393 ISBN: 0-7803-2683-0 page 64 -page 69; figures 1-14</p>	1-5
X	<p>US 5 744 915 A (NILSSEN OLE K) 28 April 1998 (1998-04-28) column 2 -column 23; figures 1-14</p>	1
A	<p>DONAHUE J A ET AL: "The LCC inverter as a cold cathode fluorescent lamp driver" APPLIED POWER ELECTRONICS CONFERENCE AND EXPOSITION, 1994. APEC '94. CONFERENCE PROCEEDINGS 1994., NINTH ANNUAL ORLANDO, FL, USA 13-17 FEB. 1994, NEW YORK, NY, USA, IEEE, 13 February 1994 (1994-02-13), pages 427-433, XP010118539 ISBN: 0-7803-1456-5 abstract; figures 1-7</p>	1,7
A	<p>LEE S W ET AL: "Simplified control technique for LCD backlight inverter system using the mixed dimming method" APEC 2001. 16TH. ANNUAL IEEE APPLIED POWER ELECTRONICS CONFERENCE AND EXPOSITION. ANAHEIM, CA, MARCH 4 - 8, 2001, ANNUAL APPLIED POWER ELECTRONICS CONFERENCE, NEW YORK, NY: IEEE, US, vol. 1 OF 2. CONF.16, 4 March 2001 (2001-03-04), pages 447-453, XP010536032 ISBN: 0-7803-6618-2 abstract; figures 1-8</p>	1,7

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INTERNATIONAL SEARCH REPORT

onal Application No

02/05467

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>MADER U: "Steady-state analysis of a voltage-fed inverter with second-order network and fluorescent lamp load" APPLIED POWER ELECTRONICS CONFERENCE AND EXPOSITION, 1996. APEC '96. CONFERENCE PROCEEDINGS 1996., ELEVENTH ANNUAL SAN JOSE, CA, USA 3-7 MARCH 1996, NEW YORK, NY, USA, IEEE, US, 3 March 1996 (1996-03-03), pages 609-615, XP010159847 ISBN: 0-7803-3044-7</p>	
A	<p>CORREA J ET AL: "A COMPARISON OF LCC AND LC FILTERS FOR ITS APPLICATION IN ELECTRONIC BALLAST FOR METAL-HALIDE LAMPS" 32ND. ANNUAL IEEE POWER ELECTRONICS SPECIALISTS CONFERENCE. PESC 2001. CONFERENCE PROCEEDINGS. VANCOUVER, CANADA, JUNE 17 - 21, 2001, ANNUAL POWER ELECTRONICS SPECIALISTS CONFERENCE, NEW YORK, NY: IEEE, US, vol. 1 OF 4. CONF. 32, 17 June 2001 (2001-06-17), pages 114-119, XP001049520 ISBN: 0-7803-7067-8</p>	
A	<p>RIBAS J ET AL: "A NEW DISCHARGE LAMP BALLAST BASED ON A SELF-OSCILLATING FULL-BRIDGE INVERTER INTEGRATED WITH A BUCK-TYPE PFC CIRCUIT" APEC 2001. 16TH. ANNUAL IEEE APPLIED POWER ELECTRONICS CONFERENCE AND EXPOSITION. ANAHEIM, CA, MARCH 4 - 8, 2001, ANNUAL APPLIED POWER ELECTRONICS CONFERENCE; NEW YORK, NY: IEEE, US, vol. 2 OF 2. CONF. 16, 4 March 2001 (2001-03-04), pages 688-694, XP001049793 ISBN: 0-7803-6618-2</p>	
A	<p>BRANAS C ET AL: "Electronic ballast for 250 W HPS lamps based on the LCC resonant inverter with soft start-up and quasi-optimum control" INDUSTRIAL ELECTRONICS, 1999. ISIE '99. PROCEEDINGS OF THE IEEE INTERNATIONAL SYMPOSIUM ON BLED, SLOVENIA 12-16 JULY 1999, PISCATAWAY, NJ, USA, IEEE, US, 12 July 1999 (1999-07-12), pages 768-773, XP010354016 ISBN: 0-7803-5662-4</p>	

INTERNATIONAL SEARCH REPORT

International Application No

02/05467

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5615093	A	25-03-1997	TW 400685 B	01-08-2000
US 5744915	A	28-04-1998	US 5428266 A	27-06-1995
			US 4184128 A	15-01-1980
			US 5512801 A	30-04-1996
			US 5471118 A	28-11-1995
			US 5459375 A	17-10-1995
			US 5757144 A	26-05-1998
			US 5469028 A	21-11-1995
			US 5479074 A	26-12-1995
			US 6002210 A	14-12-1999
			US 5446346 A	29-08-1995
			US 6459213 B1	01-10-2002
			US 5191262 A	02-03-1993
			US 5446347 A	29-08-1995
			US 5757140 A	26-05-1998
			US 5341067 A	23-08-1994
			US 5491385 A	13-02-1996
			US 5343124 A	30-08-1994
			US 5426347 A	20-06-1995
			US 5510681 A	23-04-1996
			US 5371441 A	06-12-1994
			US 6172464 B1	09-01-2001
			US 5559393 A	24-09-1996
			US 6211619 B1	03-04-2001
			US 5691603 A	25-11-1997
			US 6198228 B1	06-03-2001
			US 6211625 B1	03-04-2001
			US 5640069 A	17-06-1997
			US 5047690 A	10-09-1991
			US 5185560 A	09-02-1993
			US 5166578 A	24-11-1992
			US 5164637 A	17-11-1992
			US 6100643 A	08-08-2000
			US 5214355 A	25-05-1993
			US 5214356 A	25-05-1993
			US 5233270 A	03-08-1993
			US 6144445 A	07-11-2000
			US 5510680 A	23-04-1996
			US 5489823 A	06-02-1996
			US 5416386 A	16-05-1995
			US 5422546 A	06-06-1995
			US 5426349 A	20-06-1995
			US 5440209 A	08-08-1995
			US 5402043 A	28-03-1995
			US 5432409 A	11-07-1995
			US 5481160 A	02-01-1996
			US 5736819 A	07-04-1998
			US 4857806 A	15-08-1989
			US 5438239 A	01-08-1995
			US 4677345 A	30-06-1987
			US 4513364 A	23-04-1985